Show that $A \subset M$ is sequentially compact iff every infinite subset of $A$ has an accumulation point.

$\Rightarrow$

Assume $A$ sequentially compact and consider $S \subset A$, $|S| = \infty$. If no such $S$ exists, the result is vacuously true. Construct an injective sequence $x_n$ by choosing successive elements so that $x_{n+1} \in S - \{x_1, x_2, \ldots, x_n\}$. This is possible since $S$ is infinite. Since $A$ is sequentially compact and the sequence $x_n$ lies in $A$, the sequence $x_n$ has a convergent subsequence $x_{k_n} \to x \in A$. Then $x$ is an accumulation point of $S$ since convergence implies that for all $\epsilon > 0$, there exists $N$ such that $n > N \Rightarrow x_{k_n} \in D(x, \epsilon)$ and at most one of these $x_{k_n}$ can equal $x$.

$\Leftarrow$

Now assume all infinite subsets of $A$ have an accumulation point and consider any sequence $x_n$ in $A$. Let $S = \text{Range}(x_n)$. If $S$ is finite, $x_n$ takes on some value infinitely often, and thus has a convergent subsequence (Proof?). If $S$ is infinite, it has an accumulation point $x$ by our hypothesis. Then every $D(x, 1/n)$ has infinitely many points of $S$ so we can define a sequence $k_n$ (of increasing integers!) such that $x_{k_n}$ is in $D(x, 1/n) - \{x_1, x_2, \ldots, x_{k_n-1}\}$. This subsequence converges to $x$. 